

The characteristics of the Flora of Shanghai

Hsu Ping-sheng

Environmental and Resources Biology Department,
Fudan University, Shanghai 200 433, China

Abstract

The natural vegetation of Shanghai, is highly denuded, but the province shelters a sizeable number of exotic species, both casuals and ruderals. At present, the native flora is composed of various geographical elements and has about 492 species. The paper endeavours to provide a general picture of the flora of Shanghai.

INTRODUCTION

Shanghai is located at the mouth of Yangtze River, at latitude of $31^{\circ}14'N$ and longitude of $121^{\circ}21'E$, with an area of 6186 square kilometers. Shanghai is mainly an alluvial plain which has been opened up long ago. The natural vegetation has nothing left except the saline vegetation along the sea beaches and the freshwater vegetation. However, besides crops, vegetables and weeds, there are still a number of native species occurring in the countryside of the plain, though they are becoming less and less owing to human disturbance. These plants are mostly identical with those growing on the plain or at the foot of the hilly lands of southern Jiangsu and northern Zhejiang, and have probably originated from there. The hilly lands composed of about twenty small hills, mainly of Sheshan and Dajinshan Island, occupy only a limited area in the southwestern part of the city. The hilly land flora, therefore, represents to a great extent, the native flora of Shanghai.

The exotic flora is another important component of the local flora. Shanghai has always been the largest coastal port

and trade centre of China and has trade relations with foreign countries since long ago. This has contributed heavily to the introduction of plants from both inland and abroad.

THE NATIVE FLORA

There are about 492 species (incl. infraspecific taxa) of native seed plants in Shanghai. Based upon their present distribution, these species could be divided into seven geographical elements as follows:

(1) *North Temperate Elements*: Species have a distribution throughout most of the north temperate region. These elements, though not many in Shanghai (ca. 27 spp.), are the dominant species of the saline as well as the fresh water vegetations.

(2) *Old World Temperate Elements*: Species with a distribution in both Europe and China, and sometimes extending to Japan and Korea. These components are quite rare (ca. 9 spp.) and occur sporadically in Shanghai.

(3) *Old World Pantropical Elements*: Species with a distribution including tro-

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pical Africa, Asia and Australasia. These elements are very few in Shanghai (7 spp.). Those with their distribution confined to tropical Asia and Australasia and absent in Africa are more than the former (ca. 18 spp.).

(4) *Asiatic Tropical Elements*: Species with a distribution throughout the tropical Asia. Since Shanghai is situated along the northern border of subtropical China, these elements are limited in number (ca. 15 spp.).

(5) *Himalayan and Eastern Asiatic Elements*: Species with a distribution including the Himalayan and Sino-Japanese region. These elements are quite rare (9 spp.), and are of minor importance to the composition of the flora of Shanghai.

(6) *East Asiatic Elements*: Species with their ranges confined to Sino-Japanese region, but some of them extend northward to eastern Siberia and Far East of Russia or even to Mongolia. They are mostly temperate or subtropical elements and have the largest share in the Shanghai flora (c. 293 spp.).

(7) *Chinese Endemic Elements*: Species limited to China only. There are altogether about 123 species of such elements in the flora of Shanghai. However, these elements could be subdivided into several types according to their varied distributional patterns in China.

A table showing percentages of floristic affinities between the hilly land flora of Shanghai (altogether 311 spp.) and the adjacent regions is given below:

Table 1

Floristic region compared	Number of spp. identical	Percentage of affinity
Jiangsu Province	294	94.53
Zhejiang Province	295	94.85
Anhui Province	279	89.71
Jiangxi Province	255	81.99
Fujian Province	222	71.38
Taiwan Province	167	53.69
Japan	198	63.66

Based on the data mainly given above, the following diagnoses are postulated:

The native flora of Shanghai, which comprises altogether about 492 species, is rather a poor one as compared with the flora of the adjacent regions. One thing accounts for this is that there are only a small area of hilly lands in Shanghai and the original vegetation on these hills has, to a large extent, been disturbed or even totally destroyed by men.

The composition of the native flora of Shanghai is fundamentally similar to those of southern Jiangsu and Zhejiang Provinces but much poorer in floristic components. Asiatic or Chinese endemic elements have the largest share in the floristic composition. This is probably due to the common origin of the said flora and the absence or impassable barriers between these floristic regions; thus favouring free migration and exchange of the floristic components.

So far, almost no endemic elements have been found in the flora of Shanghai. The only exception is *Dalbergia sacerdotum* Prain, the type specimen of which was collected in Shanghai before 1901, but the precise locality is unknown. The species, however, has never been found again. Nevertheless, there are 14 species in the local flora endemic either to eastern China or to Jiangsu, Anhui and Zhejiang. The lack of endemism in the Shanghai flora shows clearly that the flora of

Shanghai, Jiangsu and Zhejiang are very closely related to one another. It also indicates that the very simple topographical and ecological conditions in Shanghai have provided no diverse habitats in which processes of speciation could have occurred extensively.

The fact that the number of East Asiatic elements (293 spp.) exceeds that of Chinese endemic elements (123 spp.) and that the high percentage of affinity of the Japanese flora with that of Shanghai reaches 63.66 broadly indicate that there is a close relationship between the flora of Shanghai and Japan. The Japanese archipelago broke away from mainland China in the Tertiary period. The Japanese flora is also of Tertiary origin.

There is a slight difference between the flora of Dajinshan Island, which is located at 30°41' N, only 6.2 kilometers away from the northern coast of Hangzhou Bay, and that of Zheshan hilly lands. The vegetation on the island is more well preserved and exhibits a stronger subtropical feature. For example, 14 (21.5%) out of the 65 species of trees and shrubs on the island are evergreen, while in the Zheshan hilly region, only (14.8%) out of the 81 species are evergreen. Furthermore, coastal elements such as *Neolitsea sericea*, *Raphiolepis integerrima*, *Eurya emarginata*, *E. japonica* and *Crepidiastrum lanceolatum* etc. which have their distribution confined to Zhejiang, Fujian, Taiwan, Japan and southern Korea, occur on the island, but are absent in the Zheshan region.

THE EXOTIC FLORA

The total number of exotic species in Shanghai is about 350. The introduction of such a considerable number of exotic species into Shanghai was probably by

agencies of railway, highway, waterway and air transportations. These exotic species could be divided into naturalized aliens and casuals according to their rate of occurrence in the local flora.

The naturalized aliens are mostly weeds. Baker (1965) has classified two types of weeds: the agrestals - plants entering agricultural land - and the ruderals - plants occurring in waste places as well as along roadsides. There are about 158 species of agrestals and 230 species of ruderals in Shanghai. However, it is sometimes difficult to differentiate these two types of weeds, for many species are both agrestals and ruderals. Most of the naturalized aliens in the local flora have their distribution exceeding eastern China, even extending to Japan; some of them are cosmopolitan species.

There are lots of casuals in Shanghai but the exact number of them has to be counted up. Some of the casuals reported for the first time in China, are *Ranunculus sardous*, *Oenothera laciniata*, *Soliva pterosperma*, *Lepidipum campestre*, etc. They are usually confined to a certain site where they have been introduced. While new casuals are emerging one after another, some have vanished. The rate of occurrence of a certain casual depends largely on its ecological amplitude to a new habitat and the extent of human disturbance of the site that the plant has inhabited.

Besides, there are a number of herbaceous or woody escapes. These species are casuals too, because up to now they have not become common weeds.

Literature cited

- Baker, H. G. 1965. Characteristics and modes of origin of weeds. In Baker, H. G. & Stebbins, G. L. (ed.), *The Genetics of Colonizing Species* New York & London. pp. 147-168.